U.S. Department of Transportation
Federal Highway Administration

New Hampshire Division

53 Pleasant Street, Suite 2200
Concord, NH 03301
(603) 228-0417

June 4, 2019

In Reply Refer To:
HDA-NH

Zach Jylkka
Fisheries Biologist
Protected Resources Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

Subject: Pease Development Authority, Port of NH Functional Replacement Project
Portsmouth 15731, Piscataqua River
Biological Assessment

Dear Mr. Jylkka:

The Pease Development Authority Division of Ports and Harbors and Federal Highway Administration (FHWA) are proposing the functional replacement of the barge wharf to compensate for impacts caused by the new alignment of the recently replaced Sarah Mildred Long Bridge in Portsmouth, NH. This letter is to request Endangered Species Act concurrence from your office for the proposed project.

The FHWA has made the determination that the proposed activity may affect, but is not likely to adversely affect, any species listed as threatened or endangered or critical habitat designated by the National Oceanic and Atmospheric Administration under the Endangered Species Act of 1973, as amended. The Biological Assessment (BA) supporting this determination is enclosed.

Please contact me at 603-410-4870 or Jamie.Sikora@dot.gov should you have any questions.

Sincerely,

Jamison S. Sikora
Environmental Programs Manager

Enclosure

ecc: Christine Perron, McFarland Johnson
Mike Johnson, NOAA
M. Laurin, NHDOT
Project file 15731

Biological Assessment

Pease Development Authority
Main Pier Functional Replacement
Market Street Marine Terminal

May 2019

Prepared By:
McFarland Johnson
53 Regional Drive
Concord, NH 03301

Appledore Marine Engineering
600 State Street
Portsmouth, NH 03801

Executive Summary

The Pease Development Authority (PDA) Division of Ports and Harbors (DPH) oversees the management, maintenance, operation, and maritime security of the ports, harbors, and navigable tidal rivers of the State of New Hampshire. Included in this charge is the Market Street Marine Terminal located on the Piscataqua River. The site is also known as the Port of New Hampshire and is the state's only deep water, public access, general cargo marine terminal.

The PDA DPH and Federal Highway Administration (FHWA) are proposing the functional replacement of the barge wharf to compensate for impacts caused by the new alignment of the recently replaced Sarah Mildred Long (SML) Bridge in Portsmouth, NH (see Figure 1). The SML Bridge once bisected the Port, with the main wharf to the east of the bridge and the barge wharf to the west. To accommodate the new bridge alignment, a large portion of the barge wharf was removed. The subject project involves replacing the lost functionality of the barge wharf by incorporating that functionality into the main wharf, which will involve extending each end of the main wharf, dredging, installing a new fender system, relocating an existing floating dock system, and providing shoreside alterations.

The purpose of this Biological Assessment (BA) is to address the effect of the Main Pier Functional Replacement Project on U.S. Endangered Species Act (ESA) listed species, listed as endangered or threatened, or their designated critical habitat.

The project is within the geographic range of the following species and critical habitat protected under the ESA (also see Table ES-1):

- Shortnose sturgeon (*Acipenser brevirostrum*)
- Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)
- Atlantic sturgeon critical habitat
- Northern long-eared bat (*Myotis septentrionalis)*
- Sea turtles (4 species)
- North Atlantic right whale (*Eubalaena glacialis*)
- North Atlantic right whale critical habitat
- Fin whale (*Balaenoptera physalus*)

The PDA DPH, on behalf of the FHWA, is pursuing informal consultation under Section 7 of the ESA on the impacts to marine species that will result from the proposed wharf project. Section 7 of the ESA assures that, through consultation with the National Marine Fisheries Service (NMFS) and/or the U.S. Fish and Wildlife Service (USFWS), Federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species, or result in the destruction or adverse modification of critical habitat.

The project is located within the known range of the northern long-eared bat. However, the project is not located in or within 1,000 feet of suitable habitat and will result in no effect to this species.

Conservation measures will be incorporated into the project to avoid or minimize impacts to the tidal habitat within the action area. With the implementation of these measures, the proposed project is not likely to adversely affect shortnose sturgeon, Atlantic sturgeon, North Atlantic right whale, Fin whale, or designated critical habitat for Atlantic sturgeon (Table ES-1). The project will have no effect on North Atlantic right whale critical habitat. Listed sea turtles are not expected to be present in the action area during the time of the project. No other listed, proposed, or candidate fish species are expected to occur in the project's action area.

Table ES-1. Summary of determinations on marine species for the proposed action

Species	Distinct Population Segment (DPS)	Listing Status	Effect Determination	Critical Habitat Determination
Shortnose sturgeon	N/A	Endangered	Not likely to adversely affect	Not applicable, no critical habitat designated
Atlantic sturgeon	Any of 5 DPSs could occur in action area	Gulf of Main DPS: Threatened All other DPSs: Endangered	Not likely to adversely affect	Not likely to adversely affect
North Atlantic right whale	N/A	Endangered	Not likely to adversely affect	No Effect
Fin whale	N/A	Endangered	Not likely to adversely affect	Not applicable, no critical habitat designated

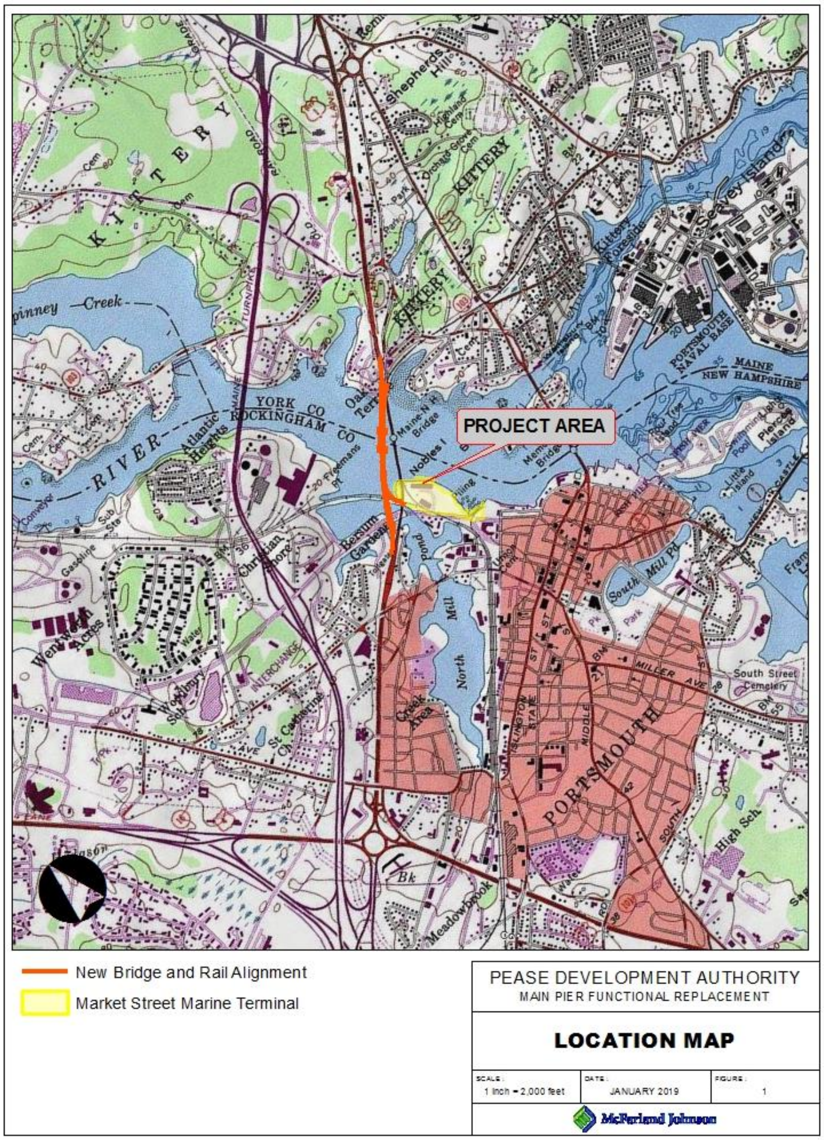

Figure 1. Location Map

Contents

1.0 Project Overview

1.1 Federal Nexus

The purpose of this Biological Assessment (BA) is to address the effect of the Port of NH Functional Replacement Project on U.S. Endangered Species Act (ESA) listed species, listed as endangered or threatened, or their designated critical habitat.

The Pease Development Authority (PDA) Division of Ports and Harbors (DPH), on behalf of the Federal Highway Administration (FHWA), is pursuing informal consultation under Section 7 of the ESA on the impacts to marine species that will result from the proposed wharf project. Section 7 of the ESA assures that, through consultation with the National Marine Fisheries Service (NMFS) and/or the U.S. Fish and Wildlife Service (USFWS), Federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species, or result in the destruction or adverse modification of critical habitat.

1.2 Project Description

The PDA DPH oversees the management, maintenance, operation, and maritime security of the ports, harbors, and navigable tidal rivers of the State of New Hampshire. Included in this charge is the Market Street Marine Terminal located on the Piscataqua River. The site is also known as the Port of New Hampshire and is the state's only deep water, public access, general cargo marine terminal. The site is adjacent to the Sarah Mildred Long (SML) Bridge carrying US Route 1 Bypass over the river. Until recently, the SML Bridge divided the port between the main wharf and the barge wharf. The bridge was recently replaced on a new alignment to improve the safety of navigating vessels, and the new bridge now passes through the western end of the barge wharf, requiring partial demolition of the barge wharf, blocking access to the boat ramp, and substantially reducing the berthing length along the barge wharf. For this reason, and due to the close proximity of the new bridge structure, the barge wharf can no longer be used to moor barges.

A number of factors currently limit operations at the Port and prevent the main wharf in its current configuration from replacing the lost operational capacity of the barge wharf. The FHWA is funding the functional replacement of the barge wharf to compensate for impacts caused by the new alignment of the SML Bridge. This project will consist of the following components (see Figure 2 and Appendix A Sheet 6):

- Construction of a new dock structure approximately 60 x 120 feet at the south end of the existing main wharf.
- Construction of a new dock structure approximately 145 x 80 feet at the north end of the existing main wharf.
- Modification of the fender system along the length of the wharf.
- Shoreside alterations, including soil and rock removal, grading, drainage, and paving within a 70,000-square foot area.
- Dredging approximately 55,000 square feet of the river bed adjacent to the north end of the extended wharf.
- Relocation of the floating dock located to the north of the main wharf.

Figure 2. Aerial View

1.3 Project Area and Setting

The Market Street Marine Terminal is located along the southern shore of the Piscataqua River in Portsmouth, New Hampshire. Waterfront facilities at the Terminal include the main wharf, barge wharf, Harbor Master's boat ramp and floating dock. The structures are located along the terminal's northern waterfront. The barker's wharf and light commercial/recreational floating docks are located along the southern portion of the terminal. The main wharf is comprised of two concrete and steel structures. The southern 304 feet of wharf (built 1966) consists of a 47-foot-wide concrete superstructure supported by steel caissons with a concrete encased steel pile (W section) core. Two access bridges, each approximately 54 feet long by 39 feet wide, connect the wharf to the shore side/backland facilities. The south access bridge was reconstructed in 2014 and the north access bridge is currently not operational. The northern 278 feet of wharf (built 1977) consists of a concrete superstructure supported by steel caissons with a concrete encased steel pile (W section) core and a steel sheet pile bulkhead. The berthing depth along the entire main wharf is approximately -35 feet based on MLLW, except along the northernmost 75 feet where it is shallower. The barge wharf was constructed in 1995 to provide vessel berthing and cargo storage space. The berth was originally designed for a -25-foot dredge depth to accommodate a 300-foot length overall (LOA) by 72-foot beam barge. However, the western half of the barge wharf was removed to accommodate the new alignment of the SML Bridge and the existing barge wharf can no longer be used to moor barges. The floating dock was constructed in 2008 for small boat operations at the facility. The boat ramp was constructed in 2018 (in the location of the removed western portion of the barge wharf), replacing the previous ramp that was demolished due to the new SML Bridge alignment.

Photographs of the Market Street Marine Terminal are located on Sheets 3 through 5 of the preliminary design plans in Appendix A.

The Piscataqua River originates northwest of the project area at the confluence of Salmon Falls River and Cocheco River between Dover, New Hampshire and Eliot, Maine and flows primarily in a southeasterly direction to the Gulf of Maine and Atlantic Ocean. The overall length of the river is approximately 12 miles. Tributaries include Bellamy River, Cocheco River, Exeter River, Lamprey River, Oyster River, Winnicut River, and Salmon Falls River. Portsmouth Harbor is approximately 4 miles downstream from the Marine Terminal.

The Piscataqua River is entirely tidal. The river depths in the main channel to the west of the Port are about 35 to 45 feet, with a maximum tidal range of 9.6 feet upstream at Dover Point to 13.2 feet downstream at Kittery Point. The Piscataqua River is the third fastest navigable river in the world due to the presence of a large water body (Great Bay) upstream and currents can reach speeds that exceed 5 knots. The NOAA-predicted tidal currents for this section of the river show a typical flood tide velocity of around 2 knots and ebb flows of about 4 knots. The Piscataqua River bottom is primarily a hard substrate, consisting largely of rock ledge, gravel, and cobble. Fine sediments generally do not settle on the substrate due to the high tidal currents in the lower estuary. The river is approximately 1,300 feet across at the location of the Port.

1.4 Consultation History

The project has been discussed at the June 20, 2018 and September 19, 2018 NHDOT Natural Resource Agency Coordination Meetings, with the US EPA, US Army Corps, NH Fish and Game Department, and NH Department of Environmental Services. The project was also discussed via telephone with the

Supervisor of Marine Programs at the NH Fish and Game Department in June 2018. A field review was held on April 2, 2019 with the NH Department of Environmental Services Wetlands Bureau, NH Fish and Game, Army Corps, and National Marine Fisheries Service.

The dredging that is part the proposed project was originally reviewed as part of the SML Bridge project and extensive coordination with NOAA took place at that time.

2.0 Federally Proposed and Listed Species/Designated Critical Habitat

The project is located within the range of eight species listed under the ESA, and within Critical Habitat designated for two species. These species are under the jurisdiction of the National Oceanic and Atmospheric Administration (NOAA).

Fish
Shortnose sturgeon (*Acipenser brevirostrum*) (32 FR 4001; Recovery plan: NMFS 1998)
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) (77 FR 5880 and 77 FR 5914)

Whales
Fin whale (*Balaenoptera physalus*) (35 FR 18319; Recovery plan: NMFS 2010)
North Atlantic right whale (*Eubalaena glacialis*) (73 FR 12024; Recovery plan: NMFS 2005)

Sea Turtles
Kemp's Ridley Turtle (*Lepidochelys kempii*) (35 FR 18319; Recovery plan: NMFS et al. 2011)
Leatherback Turtle (*Dermochelys coriacea*) (35 FR 849; Recovery plan: NMFS & USFWS 1992)
Loggerhead Turtle (*Caretta caretta*) (76 FR 58868; Recovery plan: NMFS & USFWS 2008)
Green Turtle (*Chelonia mydas*) (81 FR 20057; Recovery plan: NMFS & USFWS 1991)

Critical Habitat
Atlantic Sturgeon Critical Habitat (82 FR 39160)
North Atlantic Right Whale Critical Habitat (81 FR 4837)

The following biological assessment provides the most recent species-specific data in order to better understand potential effects the proposed project may have on listed species and critical habitat.

2.1 Shortnose Sturgeon

Shortnose sturgeon occur in rivers and estuaries along the east coast of the U.S. and Canada. In the U.S., they are listed as endangered throughout their range. Shortnose sturgeon prefer slower moving riverine, estuarine, and nearshore marine habitat of large river systems, migrating occasionally into faster moving freshwater areas to spawn. Shortnose sturgeon are known to occur in the estuarine complex formed by the Sheepscot, Kennebec, and Androscoggin Rivers (SSSRT 2010). Spawning occurs in freshwater areas. Feeding and overwintering occur in either freshwater or saltwater areas (NMFS 1998). In general, foraging habitat for shortnose sturgeon and Atlantic sturgeon overlap; however, shortnose sturgeon spawn farther upriver than Atlantic sturgeon (SSSRT 2010).

Spawning occurs in upper, freshwater reaches, usually within the natal river, over gravel, rubble, timber, scoured clay, cobble and large rocks at areas in the farthest accessible upstream reach of an undammed river or near the base of the dam or in the tailrace in a dammed river (Dadswell 1979, Taubert 1980, Dadswell et al. 1984, Buckley and Kynard 1985a and b, Kynard 1997). Spawning occurs in mid to late spring when water temperatures reach 8-9°C (SSSRT 2010). There has been no documented spawning in the Piscataqua River. The action area is not freshwater and is located near the outlet of the Piscataqua River into the Gulf of Maine; therefore, the action area does not contain suitable spawning habitat.

Little information is known about young-of-the-year (YOY) behavior and habitat use, but they are typically found in channel areas within freshwater habitats upstream of the salt wedge for about one year, as salinity tolerance increases with age (Dadswell et al. 1984, Kynard 1997). Shortnose sturgeon YOY are not anticipated in the action area.

Older juveniles, age one or older, have similar spatial and temporal patterns and habitat use as adults (Kynard 1997). Adult shortnose sturgeon have been found at temperatures from 2° to 34°C, although a temperature preference is unknown and temperatures above 28°C are thought to adversely affect them. They occur at a wide range of depths from a minimum of 0.6 m (2 ft) to 30 m (98 ft), but generally less than 20 m (66 ft) of water in the deepest parts of the river or estuary with suitable oxygen values (Dadswell 1979, Dadswell et al. 1984, Gilbert 1989, Fernandes et al. 2010). Shortnose sturgeon tolerate a wide range of salinities from freshwater (0 ppt) to seawater (32 ppt; Dadswell 1979, Holland and Yeverton 1973). Their complex migratory patterns vary by river system and they do not appear to make long distance offshore migrations, although coastal migrations of adults to neighboring rivers have been documented. Adult migrations include spring movement from overwintering sites to upriver spawning sites, late spring downstream movements to feeding areas lower in the river, and directed movement in the fall to overwintering sites (SSSRT 2010, Fernandes et al. 2010). In the northern part of its range, shortnose sturgeon are seldom found in shallow water once temperature exceeds 22°C (Dadswell et al. 1984). Individuals seem to remain in their natal river or the river's estuary (Dadswell 1979). Juvenile shortnose sturgeon are not anticipated in the action area.

The University of New Hampshire and the Conte Anadromous Fish Research Center, USGS (CAFRC), have detected both sturgeon species in Great Bay, located approximately 8 miles upstream of the action area. These fish were pre-spawning females that did not spawn in Great Bay or the Piscataqua River. Based on this data, it is assumed that migrating adult shortnose sturgeon could occur in the action area.

Overwintering occurs in deep river segments and deep depressions at depths of 10m to 30m (Dadswell et al. 1984). In northern rivers, overwintering juvenile and adult shortnose sturgeon form tight aggregations in specific, relatively deep sandy segments of the freshwater or saline reaches of the river with little movement or foraging (Dadswell 1979, SSSRT 2010). Overwintering shortnose sturgeon have not been documented in the Piscataqua River and are not anticipated in the action area.

Between spring and fall, shortnose sturgeon forage in shallow water (1 to 15 m) on sand-mud bottoms covered with aquatic plants consuming mollusks, polychaetes, and small flounders (Dadswell 1979). Shortnose sturgeon feed on a variety of benthic and epibenthic invertebrates including insect larvae, mollusks, crustaceans, and oligochaete worms (Dadswell 1979, Dadswell et al. 1984). Foraging habitat in and near the action area is assumed to be marginal at best given the lack of submerged aquatic vegetation, lack of shellfish beds, and limited benthic invertebrates. However, there may be areas of suitable foraging habitat in the vicinity of the project. Therefore, it is assumed that foraging adult shortnose sturgeon could occur in the action area.

Telemetry data obtained as part of the Navy's cooperative research program has demonstrated that shortnose sturgeon show a predictable annual use of the Piscataqua River. Although all visits observed to date have been brief (3.7 days; mean of 0.8 days), they occurred within the following patterns: pre-spawning migrant shortnose sturgeon inhabiting the Merrimack River enter the coastal Piscataqua River environment in early spring, then proceed to move to spawning sites up to 240 miles away in the Kennebec River. Shortnose sturgeon appear largely absent from the system in summer, then appear again in fall as they make their way to the Merrimack River system, taking the first step in a two-step spawning migration that would resume the following spring (Trefry 2018). In addition to the activity observed near the river mouth, shortnose sturgeon have been detected farther upstream than Atlantic sturgeon. Receivers placed as far upstream as 20 kilometers within the Piscataqua River system have detected shortnose sturgeon, as well as an adult mortality collected at the base of the South Berwick Dam in Fall 2017. Although no evidence of spawning was observed during these efforts, several logged individuals originated (were tagged in) in the Kennebec River, the Saco River, Long Island Sound, or the south coast of Long Island (Trefry 2018). Overall, the telemetry data collected to date suggest that shortnose sturgeon are largely absent from the Piscataqua River during the winter months and that only adult shortnose sturgeon may be present from April through November of any given year.

In summary, there are no spawning or overwintering sites within the action area based on existing habitat conditions and available data. The action area is tidal habitat with salinities commonly over 23 ppt. These conditions are not conducive to shortnose spawning habitat or habitat for eggs, larvae, or YOY, which require freshwater conditions. Suitable foraging habitat may be present in or near the action area. Therefore, any shortnose sturgeon that may be in the action area would likely be migrant adults opportunistically foraging between April and November.

2.2 Atlantic Sturgeon

There are five DPSs of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) listed as threatened or endangered. Atlantic sturgeon originating from the New York Bight, Chesapeake Bay, South Atlantic and Carolina DPSs are listed as endangered; the Gulf of Maine DPS is listed as threatened. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida. Atlantic sturgeon from any of the five DPSs may occur in the action area.

Atlantic sturgeon spawn in freshwater reaches of estuaries, in flowing water between the salt front and fall line of large rivers or estuarine tributaries (ASSRT 2007, Greene et al. 2009). Silt-free hard bottom substrates such as gradient boulder, bedrock, cobble-gravel, and coarse sand are required to spawn adhesive eggs (Collette & Klein-MacPhee 2002, Greene et al. 2009). Since the action area is not freshwater, spawning Atlantic sturgeon are not anticipated in the action area.

Atlantic sturgeon eggs, larvae, and young-of-the-year do not tolerate high salinities, with mortality documented at salinities as low as 5 ppt to 10 ppt (Green et al. 2009). Juveniles are found over sand, mud, cobble, rocks and transitional substrates and remain in their natal estuary for up to six years before migrating out to sea. Since no spawning occurs in the action area, and because salinities are over 20 ppt, no early life stages or juveniles are expected to occur in the action area.

Sub-adults emigrate out of their natal estuarine habitats and migrate long distances in the marine environment. Larger juveniles migrate back and forth between coastal and estuarine habitats (ASSRT 2007). Juveniles overwinter in brackish water near the mouth of estuaries, and adults and sub-adults overwinter in deeper coastal nearshore areas (ASMFC 2012). During winter months (November – March), Atlantic sturgeon primarily occupy deeper water, generally deeper than 20 m. Shallower waters are inhabited in summer and early fall (May – September) (Erickson et al. 2011). The depth of the Piscataqua River channel in the action area is less than 15 m and the depth of the river in the vicinity of the wharf is less than 10 m. However, Atlantic sturgeon do not overwinter exclusively in higher reaches as do shortnose sturgeon. Adult Atlantic sturgeon do not overwinter exclusively in riverine habitats; they are often found foraging during the winter in near shore marine water at depths less than 250 ft (Colette and Klein-MacPhee 2002).

Juvenile and adult Atlantic sturgeon frequently aggregate in upper estuary habitats around the saltwater interface (Greene et al. 2009). Adults have been documented in moderately shallow (7m to 50m) sand and gravel nearshore habitats (Stein et al. 2004, Laney et al. 2007, Greene et al. 2009). Prey items include polychaetes, amphipods, isopods, decapods, mollusks, and sand lance (Ammodytes spp.; Scott and Scott 1988, Johnson et al. 1997). Foraging habitat in and near the action area is assumed to be marginal at best given the lack of submerged aquatic vegetation, lack of shellfish beds, and limited benthic invertebrates. However, it is assumed that migrating and foraging sub-adult and adult Atlantic sturgeon could be present in the action area.

It is thought that the Piscataqua River is used as a migration corridor between foraging areas in Great Bay and spawning and overwintering areas elsewhere. Both the University of New Hampshire and the Conte Anadromous Fish Research Center, USGS (CAFRC), have detected both sturgeon species in the Piscataqua River.

The following is excerpted from the 2007 Atlantic Sturgeon Status Review (ASSRT 2007) relative to the Piscataqua River and Great Bay:

> Few Atlantic sturgeon have been captured in the Piscataqua River (Hoff 1980). A subadult Atlantic sturgeon (57 cm; likely age-1) was captured by New Hampshire Fish and Game (NHFG) in June 1981 at the mouth of the Oyster River in Great Bay (New Hampshire Fish and Game 1981). Between July 1, 1987, and June 30, 1989, New Hampshire Fish and Game surveyed the deeper tributaries of the Great Bay Estuary including the Piscataqua, Oyster, Little and Lamprey Rivers, as well as the Great Bay for shortnose sturgeon, using 30.5 m nets (3 m deep with 14 and 19 cm stretch mesh) that were fished for 146 net days. In 1988, sampling occurred in suspected spawning areas (salinities 0-10 ppt) in the spring and in suspected feeding areas (salinities around 24 ppt) in the summer. In 1989, nets were fished in May and June only (salinities 6-15 ppt). No Atlantic sturgeon were captured. However, a large gravid female Atlantic sturgeon (228 cm TL) weighing 98 kg (of which 15.9 kg were eggs) was captured by a commercial fisherman in a small mesh gill net at the head-of-tide in the Salmon Falls River in South Berwick, ME on June 18, 1990 (D. Grout, NHFG, Pers. Comm. 2006). The Salmon Falls River is a shallow tributary of the Piscataqua. Since 1990, the NHFG has not observed or received reports of Atlantic sturgeon of any age-class being captured in the Great Bay Estuary and its tributaries (B. Smith, NHFG, Pers. Comm. 2006). It is the conclusion of the SRT and NHFG biologists that the Great Bay Atlantic sturgeon population is likely extirpated.

The following is excerpted from the 2013 Biological Assessment for the SML Bridge (FHWA 2013):

> Biologists from the University or New Hampshire and the Conte Anadromous Fish Branch in Turner's Falls, MA, have arrays set up in Great Bay that have detected both Atlantic Sturgeon

and shortnose sturgeon that have tags. These arrays detected a single Atlantic Sturgeon from the New York Bight DPS in Great Bay. The Atlantic sturgeon was tagged off the New York coast in May 2012 before detection in the Great Bay 2-4 June 2012. Micah Keiffer, CAFB has spoken with commercial fishermen who are convinced there are Atlantic sturgeon in the Great Bay in numbers. In addition, most of the 19 Atlantic sturgeon tagged by CAFSC in the Merrimack were detected by collaborating researchers along the Maine Coast. This along with other observations indicate there is likely substantial sturgeon traffic along the coast in front of the Piscataqua River mouth, and probably routine movements of fish upstream into the river of unknown distances through at least the foraging season. Some Atlantic sturgeon tracked in the Merrimack River spent most of the winter in the river and occupied the river year after year, showing a level of residency that may exist in other non-reproductive drainages (M Keiffer, Pers. Comm.).

As part of a cooperative research program, the Department of the Navy has been maintaining an acoustic receiver array focused on the waters surrounding the Portsmouth Naval Shipyard, the mouth of the Piscataqua River, and the Great Bay Watershed since 2014. Based on this and other telemetry data, there have been a total of 16 tagged adult/subadult Atlantic sturgeon documented within the system since 2010. Duration of fish presence logged within the system was brief, with a maximum of 3.9 days (mean 0.7 days) for Atlantic sturgeon. Seasonal visits spanned late-April to early November, with most observations occurring in summer and typically inhabiting the waters near the mouth of the Piscataqua River. No evidence of spawning currently exists within the Piscataqua River and, at this time, it is unclear if the sturgeon are entering the river for foraging, rest, or for some other reason (Kieffer 2018).

In summary, there are no spawning sites within the action area based on existing habitat conditions and available data and overwintering is very unlikely. Potentially suitable foraging habitat may be present in the action area. Therefore, adult and sub-adult Atlantic sturgeon are most likely to occur in the nearshore action area between April and November. Adult and sub-adult Atlantic sturgeon could be present at the disposal site year-round.

2.3 Atlantic Sturgeon Critical Habitat

The project is located within Critical Habitat for the Gulf of Maine (GOM) DPS of Atlantic sturgeon. The Piscataqua River has been designated as critical habitat for the GOM DPS by the Greater Atlantic Regional Fisheries Office (GARFO). Atlantic sturgeon critical habitat consists of four physical or biological features (PBFs):

- Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
- Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: Unimpeded movements of adults to and from spawning sites; seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; staging, resting, or holding of subadults or Spawning condition adults. Water depths in main river channels must also be deep enough (e.g., at least

1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and;

- Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: Spawning; annual and interannual adult, subadult, larval, and juvenile survival; and larval, juvenile, and subadult growth, development, and recruitment (e.g., 13 °C to 26 °C for spawning habitat and no more than 30 °C for juvenile rearing habitat, and 6 mg/L or greater DO for juvenile rearing habitat).

The first PBF is not present in the action area because low salinities are not present. The second PBF is present in the action area because soft substrates are present and could provide suitable foraging habitat. The third and fourth PBFs are present within the action area, with suitable salinities, depths, passage, temperatures, and oxygen values to support the survival and unimpeded passage of subadult and adult Atlantic sturgeon. The action area does not contain PBFs for spawning or rearing.

2.4 Whales

The endangered North Atlantic right whales (*Eubalaena glacialis*) and fin whales (*Balaenoptera physalus*) are found seasonally in Gulf of Maine waters. These species may be present at the Cape Arundel Disposal Site and along the transit route. North Atlantic right whales have been documented in the Gulf of Maine from December through June, with relatively high numbers in January through May. The seasonal presence of right whales is thought to be closely associated to the seasonal presence of dense patches of their preferred copepod prey. Fin whales found off the eastern United States are centered along the 100-meter (328 foot) isobaths; however, sightings are spread out over shallower and deeper water, with their summer feeding range occurring mainly between 41°N and 51°N, from shore seaward to the 1,000-fathom (6,000 feet) contour (NMFS 2010; Kenney and Winn 1987; Hain et al. 1992).

Based on available information, foraging and overwintering adult and juvenile North Atlantic right whale and fin whale could occur in the vicinity of the Cape Arundel Disposal Site and the transport route. Whales are not expected to be present in the Piscataqua River.

2.5 North Atlantic Right Whale Critical Habitat

A portion of the proposed transport route to the Cape Arundel Disposal Site overlaps with North Atlantic right whale critical habitat (Unit 1, Northeastern foraging habitat). The following four physical and biological features (PBFs) of foraging habitat have been identified in the final rule as essential to the conservation of the species: (1) The physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate *Calanus finmarchicus* for right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes; (2) Low flow velocities in Jordan, Wilkinson, and Georges Basins that allow diapausing *C. finmarchicus* to aggregate passively below the convective layer so that the copepods are retained in the basins; (3) Late stage *C. finmarchicus* in dense aggregations in the Gulf of Maine and Georges Bank region; and (4) Diapausing *C. finmarchicus* in aggregations in the Gulf of Maine and Georges Bank region.

The action area overlaps with designated critical habitat in the Gulf of Maine, although it is not located within the vicinity of Georges Bank or Jordan, Wilkinson, and Georges Basins. Only two of the four PBFs to right whale foraging, as described above, are considered likely to be present – PBF 1, physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region; and PBF 3, an aggregation of the copepod *Calanus finmarchicus*.

2.6 ESA-Listed Sea Turtles

Four species of federally listed threatened or endangered sea turtles are found seasonally in the coastal waters of New Hampshire and Maine, including in the vicinity of the Cape Arundel Disposal Site and proposed transit route. These species include the threatened Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead turtle (*Caretta caretta*), North Atlantic DPS of green turtle (*Chelonia mydas*), the endangered Kemp's Ridley turtle (*Lepidochelys kempii*), and Leatherback turtle (*Dermochelys coriacea*). In general, listed sea turtles are seasonally distributed in coastal U.S. Atlantic waters, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters. As water temperatures rise in the spring, these turtles begin to migrate northward. As temperatures decline rapidly in the fall, turtles in northern waters begin their southward migration. Sea turtles are expected to be in the vicinity of the Cape Arundel Disposal Site in warmer months, typically June through October. The only portion of the action area within the range of listed sea turtles is the off-shore transport and disposal of dredged material. Transport of dredged material will be completed by April, before sea turtles would be expected to be present. Further, the disposal site is at a depth that is deeper than what benthic foraging sea turtles would be expected to use. For these reasons, sea turtles are not expected to be present in the action area during the time of the project.

3.0 Environmental Baseline

3.1 Aquatic Habitat

The Piscataqua River is entirely tidal. The river depths are 35 to 45 feet deep in the channel of the river and 24 to 34 feet in the vicinity of the wharf. The tidal range is 9.6 feet upstream at Dover Point to 13.2 feet downstream at Kittery Point. Table 1 summarizes tidal elevations based on the NOAA tide station 8419870, Seavey Island, tidal epoch 1983-2001.

TABLE 1. TIDAL DATUM

DATUMS	Elevation (ft)
HIGHEST OBSERVED TIDE (HOWL) (02/07/78)	12.52
HIGHEST ASTRONOMICAL TIDE (HAT) (06/15/95)	10.52
MEAN HIGHER HIGH WATER (MHHW)	8.84
MEAN HIGH WATER (MHW)	8.43
NORTH AMERICAN VERTICAL DATUM (NAVD88)	4.62
MEAN SEA LEVEL (MSL)	4.43
MEAN TIDE LEVEL (MTL)	4.38
NATIONAL GEODETIC VERTICAL DATUM (NGVD29)	3.86
MEAN LOW WATER (MLW)	0.32
MEAN LOWER LOW WATER (MLLW)	0.00
MINIMUM OBSERVED TIDE (LOWL) (11/30/55)	-3.35

The river typically has flood tide velocities of around 2 knots and ebb flows of about 4 knots. The river is approximately 1,300 feet across at the location of the wharf.

According to the NH Coastal Viewer (2019), the action area is not located within mapped shellfish habitat. The shoreline within the action area consists of stone riprap. There is no salt marsh in the action area. See Photos 1 and 2 below.

According to the NH Coastal Viewer (2019) eelgrass mapping, eelgrass has occurred in the vicinity of the action area in the past (mapped in 1996), with historic eelgrass beds located approximately 400 feet northwest of the wharf and approximately 1,200 feet to the northeast. However, as part of the SML Bridge replacement project, eelgrass surveys were performed on July 17, 2013 by MaineDOT dive crews in the vicinity of the proposed bridge, located just upstream of the action area. A two square foot patch of eelgrass was found on the Kittery, Maine side of the bridge and sporadic eelgrass shoots were identified on the Portsmouth side. In addition, a second eelgrass survey was completed using a ROV camera on September 11, 2013 in the area of the proposed dredge. This survey found sporadic eelgrass shoots but no collections of plants forming any beds. The 2017 eelgrass mapping does not show any eelgrass beds in or near the action area. Based on the 2017 mapping, the nearest eelgrass bed is located approximately 4,400 feet downstream of the action area along the north side of Pierce Island.

Photo 1. Location of north wharf extension

Photo 2. Location of south wharf extension

The Cape Arundel Disposal Site is a regional disposal site located approximately 23 nautical miles northeast from Portsmouth Harbor and 2.8 nautical miles southeast of Cape Arundel, Maine . The site is characterized by a north-south trending trough that has a maximum depth of 43 meters and a silt/clay bottom admixed with fine sand.

3.2 Temperature and Salinity

Larsen and Doggett (1976) measured November temperatures and salinities at the Memorial Bridge, approximately 3,000 feet downstream of the project area, and at the Interstate I-95 Bridge, approximately 3,000 feet upstream of the project area, and recorded salinities between 26.1 parts per thousand (ppt) and 23 ppt at the surface, and more uniformly around 27 ppt the deeper they measured. Low tide readings were around 23.6 or less. In the EFH worksheet developed for the Memorial Bridge downstream of this bridge, the New Hampshire Department of Transportation reported that salinities can reach upwards of 30 ppt.

Water temperatures were 10° C (50° F) at high tide and 13°C (55.4°F) at low tide when measurements were taken in the month of November.

3.3 Water Quality

The Piscataqua Region Estuaries Partnership Environmental Data Report, published December 2017, shows the median total suspended solids (TSS) for the Upper Piscataqua River at approximately 15mg/L in 2015, with a maximum of 60mg/L. In 2015, Portsmouth Harbor, which is south of the action area, had 0 days with Dissolved Oxygen (DO) levels <5 mg/L.

3.4 Sediment Characteristics

A grain size analysis was performed on November 23, 2018 on soil samples from the proposed dredge site within the action area (Appendix B). According to the analysis, substrate in the dredge area consists of over 99% coarse grain material, primarily gravel (over 50%) and sand (37-47%), with less than one percent of silt and clay particles and no cobbles. The substrate in the area of the proposed wharf extensions is primarily cobbles.

3.5 Noise

In April 2013, ambient background sound pressure levels (SPL) beneath the SML Bridge (on its former alignment) were approximately 100 to 140 dB, consistent with existing research on ambient SPL in high current estuarine environments.

3.6 Vessel Traffic

The proposed project is located in the Piscataqua River, which includes a 6.2-mile federal navigation channel that extends from the river's mouth at New Castle to the head of deep-draft navigation at Newington, NH/Eliot, Maine. The channel supports a wide variety of commercial and recreational activities along the river, with over 600 vessels with drafts between 0 and 39 feet recorded on the river in 2016. Commercial vessels averaged approximately 78 vessel visits per year based on 2011 data. Commercial vessels range in length from 420 feet to 747 feet, with most vessels in the 20,000 to 50,000 deadweight tonnage (DWT) range. The Market Street Marine Terminal, located on the south bank of the Piscataqua River, is the state's only deep water, public access, general cargo marine terminal. The terminal accommodates year-round operations and vessels include bulk cargo carriers, liners, barges, and passenger vessels.

4.0 Project Details

4.1 Construction Activities

The project consists of the following components:

- Construction of a new dock structure approximately 60 x 120 feet to expand the south end of the existing wharf.
- Construction of a new dock structure approximately 145 x 80 feet to expand the north end of the existing wharf.
- Installing a new fender system along the length of the main wharf.
- Dredging approximately 55,000 square feet of the river bed adjacent to the north end of the extended wharf.

- Relocation of the floating dock currently located off the north end of the wharf.
- Shoreside alterations, including soil and rock removal, grading, drainage, and paving within a 70,000-square foot area.

Preliminary design plans are located in Appendix A.

4.1.1 Project Timeline and Duration

Construction of this project is tentatively scheduled to begin in the winter of 2020. The total duration of construction is anticipated to be approximately 18 months. The construction start date is not yet known, and final construction sequencing will be determined by the Contractor. In order to maintain competitiveness during the bid process, means and methods of construction are not final, giving contractors the ability to propose specific methods and equipment. The following is an outline of the likely construction sequence. This sequence may vary slightly depending on the selected contractor.

Dredging/Blasting

Dredging will occur within a 55,000 square foot area directly adjacent to the proposed northern wharf extension to a depth of -36 feet. The duration of dredging is anticipated to be approximately 3 months. Within the dredge area, a 10,000 square foot area will require blasting to remove approximately 1,000 cubic yards of rock. The duration of blasting is anticipated to be approximately 2 to 4 weeks. A total of approximately 17,000 cubic yards of sediment and rock will be removed from the dredge area, with sediment consisting primarily of sand and gravel.

During blasting and dredging activities, the partial demolition of the former SML bridge abutment and Pier 14 will be carried out in the area of the northern wharf extension. These structures are concrete/granite and will be partially removed using a hydraulic breaker or similar equipment to break apart the concrete or alternatively blasting. Pier 14 will be removed down to 5 feet below mudline. The top of the bridge abutment as well as 1 foot of the exposed facing will also be removed. The remaining abutment will be incorporated into the proposed wharf structure. All concrete debris will be removed.

The Contractor will use an excavator or heavy clamshell bucket for removing sediment and debris. The material will be transported by a dredge scow. The preferred disposal site is the Cape Arundel Disposal Site located approximately 2.8 nautical miles southeast of Cape Arundel, Maine. The final determination of the disposal method is governed by the Army Corps of Engineers. The documentation has been submitted and a response from the agency is pending.

Avoidance and Minimization Measures – Blasting and Dredging

1. Dredging, blasting, and concrete demolition will occur between November 15 and March 15.
2. A blasting plan will be submitted by the Contractor for approval prior to detonation of explosives.
3. The following mitigation techniques will be implemented to reduce the sound pressure resulting from blasting:
   - Stemming and decking of individual charges;
   - Staggered detonation of charges in a sequential blasting circuit;
   - Blasting during periods of slack tide;

- Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety is a concern.

Wharf Extension

Pile Installation

The two sections of proposed wharf will consist of concrete filled steel pipe piles with a reinforced concrete deck structure. The elevation of each deck would be raised to 15.1 feet (MLLW datum) to account for anticipated sea level rise and each deck would ramp down to the existing deck. Sockets will be drilled into bedrock for the pile installation. Steel piles will be installed in the drilled holes, which will then be filled with concrete. The south extension will require a total of 35 piles, with a 40" diameter socket, and the north extension will require a total of 51 piles of the same diameter. The estimated area of direct impacts from the socketed piles is approximately 440 square feet. Socketed piles are the preferred method of pile installation due to the reduced underwater noise impacts. To help prevent corrosion to the steel piles, sacrificial anodes will be installed at each pile. All piles will be coated with a marine grade coating system.

Socket drilling is expected to occur after March 15. It is anticipated that each hole will take approximately 3 days to drill.

Seawall

Sections of seawall will be necessary along the shore at the two new sections of deck. The seawall will be a 9-foot high cast-in-place concrete retaining wall. Both abutments will be 10 feet wide and 10 feet tall. The south abutment will be 120 feet in length (1,010 square feet of impact); the north abutment will be 40 feet in length (270 square feet of impact). The seawalls will rest on a gravel subbase, and this subbase and the seawalls will be above MLLW.

Seawall construction will entail the following:

1. Install sheet pile cofferdams to retain shoreside soils
2. Excavate down to elevation +3 feet MLLW outboard of the cofferdam
3. Install subgrade
4. Install reinforcing steel and build forms
5. Cast wall and strip forms
6. Backfill/install riprap/pave

The seawall for the north wharf extension will include a 1-foot thick concrete facing on the existing steel sheet pile wall and existing concrete bridge abutment.

Seawall construction is expected to occur after March 15 and be approximately 3 months in duration.

Avoidance and Minimization Measures

A sheetpile cofferdam wall will be installed shoreside of the retaining wall to minimize erosion and turbidity during the wall installation. Excavation of riprap and subgrade will occur at periods of lower water levels to reduce turbidity. Once the design excavation elevation of +3 is achieved the contractor will install the stone subgrade to stabilize the area prior to wall installation.

Pile Caps and Deck

Once the piles and abutments are in place, the cast-in-place pile caps and pre-cast deck planks will be installed. The south wharf extension will be approximately 9,600 square feet and the north extension approximately 13,600 square feet.

Fender System

The existing fender system will be removed and replaced with a system that can accommodate all required uses of the facility. The proposed fender system will extend to -2' MLLW and be designed for both barges and larger vessels. The fender elements will consist of rubber fenders, with a steel panel and polyethylene facing. The construction of steel or concrete haunches on the existing pile caps will be required to support the new fender systems.

A hanging fender system will be installed along the entire length of the main wharf. Construction of the haunches will require in-water work.

Floating Dock

An existing floating dock is located near the barge wharf and will be relocated off the barge wharf. The dock will be 120' long and 13' wide (1,560 square feet). The floating dock will require 7 rock socketed guide piles with 22" diameter sockets. The floating dock requires replacement of three concrete float modules with adequately sized internal guide pile assemblies. External guide pile assemblies will be attached to either end of the floating dock. The floating dock configuration will allow for berthing on either side.

Shoreside Alterations

Shoreside alterations will consist of site grading, drainage, and paving and will be constructed concurrently with the wharf extension work. All shoreside work will be located above the Highest Observable Tide Line and will not require in-water work. All appropriate sedimentation and erosion control measures, including silt socks, inlet filters, and sediment traps, will be installed during construction to avoid impacts to the river.

4.1.2 In-Water Work

All construction activities except the shoreside alterations will require in-water work.

Dredging, blasting, and concrete removal will take place between November 15 and March 15. The duration of construction will be approximately 18 months, with in-water work required throughout that timeframe.

In-water work will be completed at lower water levels for the seawall construction whenever possible. Debris booms will be utilized to further contain the work area.

5.0 Project Action Area

5.1 Limits of the Action Area

The action area, as defined under 50 CFR §402.02, includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The nearshore action area, as currently proposed, extends 1,000 meters (3,300 feet) upstream and downstream of the proposed project as shown in Figure 3. The basis for the selection of the 3,300 feet upstream and downstream of the proposed project was due to the limits of the turbidity effects in the Piscataqua River. Although sedimentation is not expected to be long lasting or severe based on the high velocity of currents that run through the area, the effects from sedimentation are expected to be wider ranging than noise effects.

In addition, the action area includes an offshore component due to the proposed transport route for the disposal of dredged material at the Cape Arundel Disposal Site, located approximately 20 nautical miles from the project and extending to a 1,981-meter radius from the disposal site (ACOE 1983). The offshore action area is shown in Figure 4. Lastly, the action area includes all routes taken by the project vessels. This area is expected to encompass all of the effects of the proposed project.

The action area was determined as follows:

Footprint of direct impacts
Dredging is proposed within an area of 55,000 square feet.

Piles for the wharf extensions and floating dock, and abutments for the sea wall, will impact an area of 1,720 square feet below the Highest Observable Tide Line.

Disposal of approximately 17,000 cubic yards of dredged material at Cape Arundel Disposal Site.

Shading
The total wharf extension and floating dock will result in approximately 25,000 square feet of shaded habitat.

Noise
The proposed sheet pile cofferdam installation is expected to be the project activity producing the largest ensonified area, with potential behavioral effect to fish occurring up to 90 meters (300 feet). Blasting of bedrock will also impact in-water sound pressure levels. Based on consultation for the SML Bridge project (FHWA 2013), physiological effects to fish resulting from increased sound pressure levels could occur up to 30 meters (98 feet) from the blasting site and behavioral effects to fish could occur up to 61 meters (200 feet).

Sedimentation
The proposed mechanical dredging is expected to be the project activity with the greatest impact on turbidity. Based on consultation for the SML Bridge project (FHWA 2013), dredging could result in a sediment plume that extends up to 1,000 meters (3,300 feet) upstream or downstream from the site, with the direction of the plume dependent upon the tide. The dredging area is located along the southern shoreline of the river. Given the high velocity currents in the river, it is unlikely that any suspended sediments from the proposed dredging would extend across the entire width of the river. To be conservative, it is assumed that suspended sediments could impact approximately half the width of the channel.

Vessel Traffic

The proposed project includes the disposal of dredged material at the Cape Arundel Disposal Site. The material will be transported to the disposal site by barge, following a 20 nautical mile route located just east of York Ledge. The material will be transported by a dredge scow, with the number of trips determined by the size of the equipment used by the contractor.

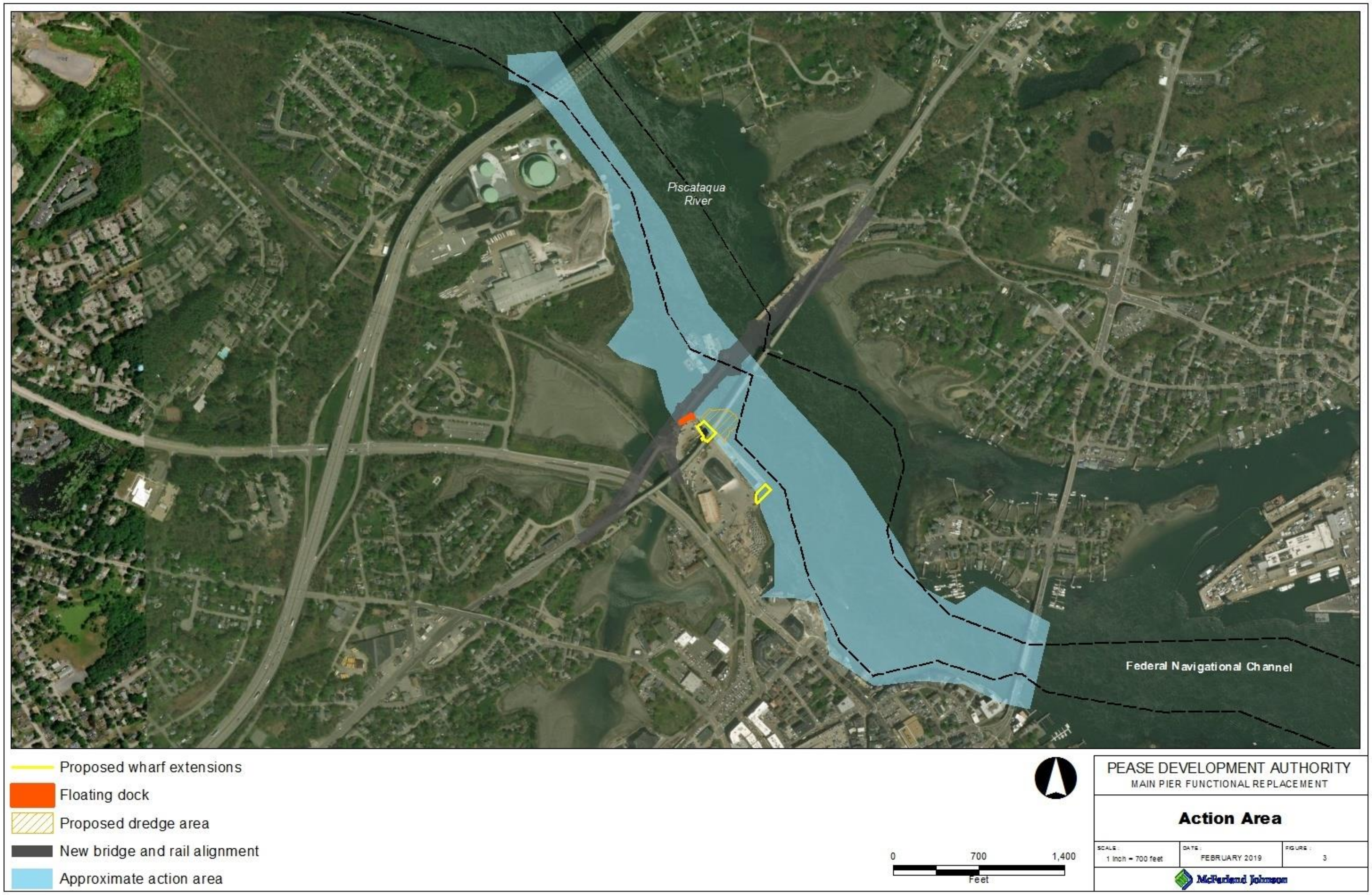

Figure 3. Nearshore Action Area

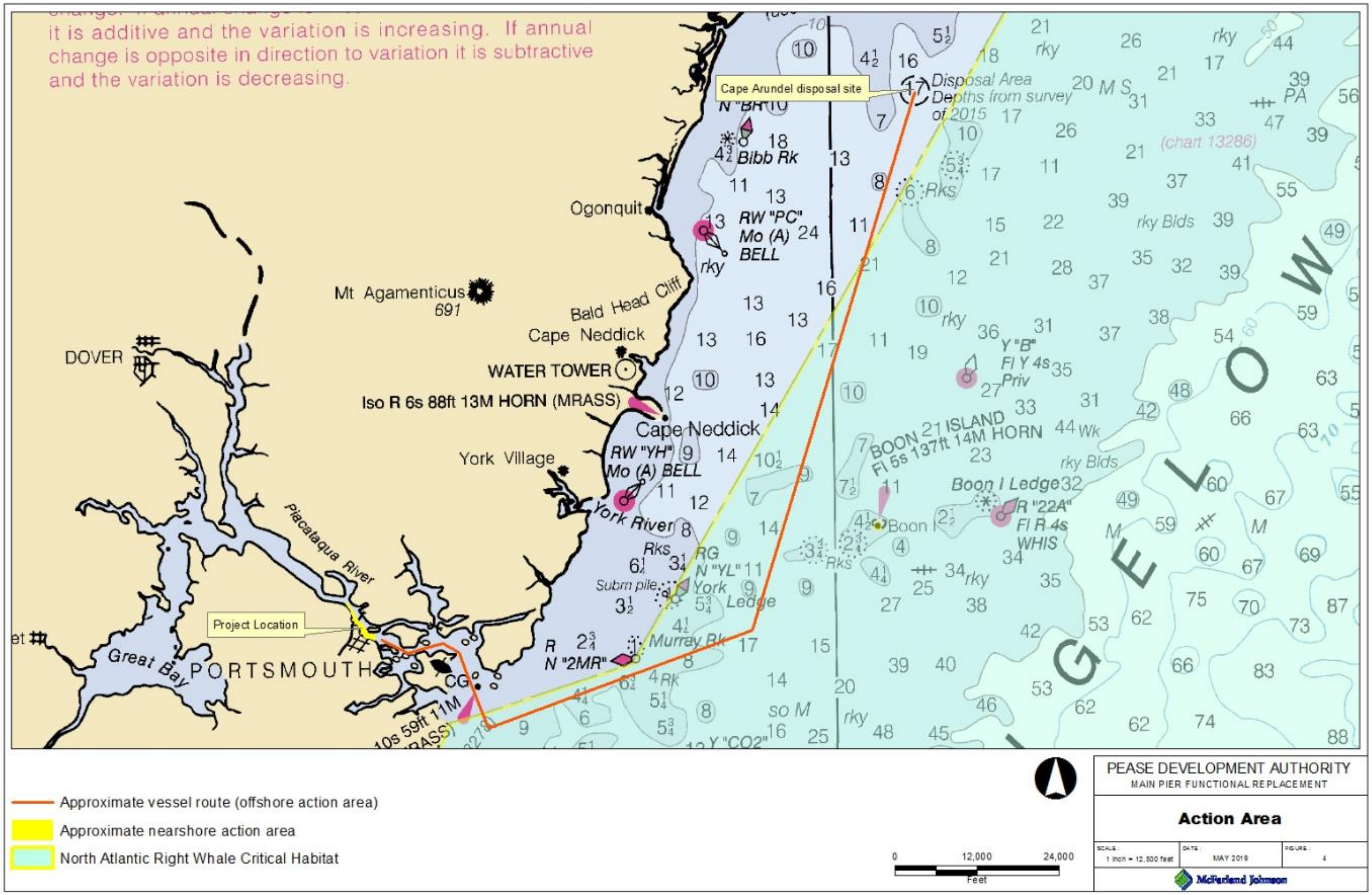

Figure 4. Offshore Action Area

6.0 Effects Analysis

The proposed wharf extension is within the known and expected range of ESA-listed species and in designated critical habitat. Section 4 lists avoidance and minimization measures that will be employed to minimize the potential for adverse effects to listed species. North Atlantic and fin whales will not be present in the Piscataqua River and only be exposed to effects from the disposal and project vessel traffic. The proposed blasting and dredging will take place between November 15 and March 15, the period when the occurrence of sturgeon species is not expected in the river. However, the remaining in-water construction activities will take place when both species could occur. Therefore, the project could result in impacts to both sturgeon species. These species are potentially susceptible to hydroacoustic impacts, increased turbidity and other water quality impacts, capture or entrapment in dredging equipment, vessel strikes, and modification of foraging and migratory habitat. The sections that follow provide details on potential effects.

It is recognized that climate change is expected to cause a warming of approximately 0.5° F over the next few decades, more intense extreme weather such as droughts and storm events, and a rise in sea level (Walsh et al. 2014). There is potential for these factors to eventually affect spawning and migration times, habitat suitability, and forage resources of shortnose sturgeon and Atlantic sturgeon. The proposed project will take place over a period of 18 months and any effects of climate change will not be fully realized until after the construction is complete. The effects of climate change will not be considered further in this biological assessment.

6.1 Direct and Indirect Effects

6.1.1 Hydroacoustic Noise

Under certain conditions, noise generated from construction activities may cause behavioral or physiological changes to aquatic organisms. Behavioral changes often include avoidance of the action area, disruption of foraging attempts, or interruption of reproduction. Depending on the duration and intensity of sound produced during construction, aquatic organisms could suffer hearing loss, ranging from temporary to permanent. Other potential percussion injuries include bruising, damage to the swim bladder and internal organs, or death.

NOAA generally uses 150 dB root mean square (RMS) as the threshold for behavioral effects to listed fish species (Buehler et al. 2015). In 2008, the Fisheries Habitat Working Group (FHWG) developed the *Agreement in Principal for Interim Criteria for Injury to Fish from Pile Driving Activities*, which identifies the following thresholds for onset of physical injury to fish: 206 decibels (dB) peak; 187 dB cumulative sound exposure levels (SELs) for fish 2 grams or greater; and 183 dB cumulative SEL for fish of less than 2 grams (FHWG 2008).

In April 2013, ambient background SPL beneath the SML Bridge (on its former alignment) were approximately 100 to 140 dB, consistent with existing research on ambient SPL in high current estuarine environments.

Northern right whale and fin whale do not occur in the location where hydroacoustic noise will be generated from construction activities. Therefore, the effects of noise on whales will not be considered further.

Blasting

All blasting will take place between November 15 and March 15, a period of time when shortnose sturgeon is not expected in the action area and the presence of Atlantic sturgeon is unlikely.

The following information is from consultation for the SML bridge project (FHWA 2013). There have been numerous studies that have assessed the direct impact of underwater blasting on fish (e.g., Teleki and Chamberlain 1978; Wiley *et al.* 1981; Burton 1994; Moser 1999). While none of the studies have focused on sturgeon, the results demonstrate that blasting does have an adverse impact on fish. Teleki and Chamberlain (1978) found that several physical and biological variables were the principal components in determining the magnitude of the blasting effect on fish. Physical components include detonation velocity, density of material to be blasted, and charge weight; while the biological variables are fish shape and size, location of fish in the water column, and swim bladder development. Composition of the explosive, water depth and bottom composition also interact to determine the characteristics of the explosion pressure wave and the extent of any resultant fish kill. Furthermore, the more rapid the detonation velocity, the more abrupt the resultant hydraulic pressure gradient, and thus, the more difficult fish have in adjusting to the pressure changes. That is, it is the pressure oscillations created by the detonation that causes a rapid contraction and over-extension of the swim bladder as pressure gradients change; this results in internal damage and/or mortality to species of fish (Wiley *et al.* 1981). If blasting detonations are undertaken at one time *(i.e.,* not set up to be delayed), fish cannot recover from these pressure oscillations, resulting in injuries to internal organs (e.g., swim bladder ruptures) that may result in death. However, explosives will be placed into boreholes within the ledge. This, combined with delayed blasting and stemming of each borehole, reduces the overpressures that will enter the surrounding water per blasting event, thus reducing the pressure gradients experienced by aquatic species. However, even with this reduction, elevated levels of pressure and noise will still be emitted within the waters surrounding the demolition site and thus, have the potential to affect sturgeon.

Currently, there are no acoustic guidelines or protective criteria for listed species specific to blasting. There have been no studies undertaken to assess the effects of blasting on Atlantic sturgeon. However, a study done by Moser (1999) on the effects of blasting on shortnose sturgeon has been conducted. Because of their physiological similarities, this study will serve as guidance in determining levels of pressure that will cause effects to shortnose and Atlantic sturgeon. Moser (1999) conducted test blasting in the Wilmington Harbor, North Carolina, in December 1998 and January 1999 in order to adequately assess the impacts of blasting on shortnose sturgeon and the size of the LDI area (the lethal distance from the blast where 1% of the fish died). Results of the study indicated that there was a 100% survival rate of shortnose sturgeon at 43 meters from the blast area. Moser (1999) stipulated that shortnose sturgeon may be less susceptible and less sensitive to blasting effects due to the fact that the swim bladder in shortnose sturgeon is connected to the esophagus, allowing gas to be expelled rapidly without damage to the swimbladder *(i.e.,* physostomus). Based on this and the best available information, peak pressure levels at, or below, 75.6 psi, and peak impulse levels at, or below 18.4 psi-msec, are not anticipated to cause injury or mortality to species of sturgeon, including Atlantic sturgeon.

Exact psi levels that will be produced during blasting are unknown at this time. However, the US Coast Guard estimated psi levels obtained from a bridge demolition project in New Jersey. By using estimated charge weights of no more than 12 kilograms (26.6 pounds) per delay, the associated psi levels ledge blasting in the Piscataqua will be comparable to those produced during the bridge demolition project conducted in New Jersey. Therefore, estimated underwater noise levels produced during the demolition of the New Jersey Rt. 52 Bridge across Great Egg Harbor Bay can serve as a reference in the assessment of underwater noise levels produced during the ledge removal required for the wharf extension. It is estimated that within 30 meters (100 feet) of each detonation, psi levels will be approximately 6.6 psi, or approaching 187 dB RMS (USCG 2012; NMFS 2012c), which is below levels thought to cause injury or mortality to species of sturgeon. At a distance closer to the detonation *(i.e.,* within 10 meters), these pressure levels will be higher and therefore, have the potential to adversely affect sturgeon. To ensure sturgeon are not exposed to these elevated levels of sound pressure, BMPs will be implemented:

- Stemming and decking of individual charges;
- Staggered detonation of charges in a sequential blasting circuit;
- Blasting during periods of slack tide;
- Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area;
- Require the use of sonar and the presence of a fisheries and marine mammal observer;
- Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety is a concern.

Given the proposed protections to be used during blasting, and the rarity of sturgeon in the action area when the blasting will take place, any physical effects to sturgeon from blasting would be extremely unlikely and are therefore discountable.

In addition to physical effects, blasting operations may also induce changes in behavior of listed species. Currently, there is no information on the underwater noise levels or overpressures produced during blasting that may cause behavioral changes in sturgeon. However, for purposes of assessing behavioral effects resulting from pile driving at several West Coast projects, a 150 dB re 1 µ Pa RMS sound pressure level criterion was employed at several sites, including the San Francisco-Oakland Bay Bridge and the Columbia River Crossings. No specific studies have considered the behavior of Atlantic sturgeon in response to blasting noise. However, given the available information from studies on other fish species (e.g., Anderson *et al.* 2007; Purser and Radford 2011; Wysocki *et al.* 2007), 150 dB re 1 µ Pa RMs is considered to be a reasonable estimate of the blasting noise level at which exposure may result in behavioral modifications, and will be used as a conservative indicator of the blasting noise level at which there is the potential for behavioral effects. That is not to say that exposure to noise levels of 150 dB re 1 µ Pa RMS will always result in behavioral modifications, but that there is the potential, upon exposure to noise at this level, to experience some behavioral response (e.g., temporary startle to avoidance of an ensonified area).

Using the equation SPL dB =20 Log P psi+ 170.8 (Kinsler and Frey, 1962), psi values can be converted to dB levels and an approximate attenuation rate can be estimated. With that information, an approximate distance can be estimated from the source at which sound pressure levels would be below 150 dB re 1 µ Pa RMS. Based on this information, underwater noise levels of 150 dB re 1 µ Pa will likely be experienced within 61 meters (200 feet) of the blasting site. However, the habitat characteristics (no submerged aquatic vegetation, no shellfish beds, limited benthic invertebrates) near the blasting site suggests that it is unlikely that sturgeon will be foraging in the vicinity of the blasting site. However, as suitable forage may exist in other portions of the lower Piscataqua River, Atlantic sturgeon may be transiting through the area to reach these suitable foraging sites, although available data indicate that the presence of Atlantic sturgeon in the action area during the period of time when the blasting is proposed is very unlikely.

Should a listed sturgeon migrate into the area of the Piscataqua River where the 150 dB re 1 µ Pa RMS isopleth extends *(i.e.,* 61 meters (200 feet) from the source), it is reasonable to assume that a sturgeon, upon detecting underwater noise levels of 150 dB re 1 µ Pa RMS will modify its behavior such that it redirects its course of movement away from the ensonified area and, therefore, away from the project site. If any movements away from the ensonified area do occur, these movements will not amount to substantial changes to essential Atlantic sturgeon behaviors *(e.g.,* spawning, foraging, resting, and migration) as the extent of underwater noise will not present a barrier to sturgeon movements (the width of the river at the wharf site is approximately 400 meters (1,300 feet) at low tide and the maximum extent of underwater noise is 61 meters (200 feet) from the blasting site). Therefore, movements away from the ensonified area will not preclude the continuation of normal behaviors *(e.g.,* feeding, spawning, overwintering and migrating) in other portions of the river. Based on this analysis, adverse effects to listed species from exposure to underwater acoustic disturbance associated with blasting will be too small to be meaningfully measured or detected and will therefore be insignificant.

Socket Drilling

Proposed socket drilling for the new piles and drilling for concrete demolition could also result in elevated noise levels. The following information is from consultation for the SML Bridge project (FHWA 2013). Drills generate noise and vibrations when in operation as a result of friction between the drill bit face and the material it is boring through *(i.e.,* ledge is denser than concrete, so there is greater friction resulting in higher noise and vibration levels than for softer materials) (Transit Link Consultants 2008). The generated noise and vibration from the drill produces sound waves that travel through the substrate. Detailed data on the underwater noise associated with the exact drill to be used is not available, but information on underwater noise from geotechnical drills is available. As these drills work in a similar fashion, it is reasonable to use the source levels associated with geotechnical drills as a surrogate for the specific drill to be used for this project. Unmitigated sound levels from underwater geotechnical drills have been estimated at 118-145 dB re 1 µ Pa at 1 meter, with noise decreasing to 101.5 dB at 150 meters, 97.0 dB at 250 meters, and 94.1 dB at 350 meters. In an analysis completed by NOAA in Washington State, it was concluded that rotating steel casements for drilled shafts are not prone to elevate underwater sound to a level that is likely to cause injury or noise that would induce adverse changes to fish behavior. Further, the ambient sound levels in the river are approximately 100 to 140 dB. Based on this analysis, there would be no behavioral or physical effects from rock socket or concrete drilling on any Atlantic or shortnose sturgeon in the action area when added to baseline conditions.

Sheet Pile Cofferdam Installation

Sheet pile cofferdams will be installed prior to the construction of the seawall. Cofferdam construction will entail the vibratory and/or impact hammer installation of a series of interlocking 24 inch wide steel sheets. The substrate that the sheets are being driven into determines the duration of the driving event for each pair of sheets. A pair of sheets that are driven into finer material will take approximately 15 minutes. A pair of sheets driven into material with larger rocks and substrate that makes for more challenging driving conditions can take up to 1 hour. It is assumed that the cofferdam will take up to 10 days to install. The sheet piles will be removed with a vibratory hammer when seawall construction is complete.

To evaluate the effects of sheet pile installation, measurements taken from the unattenuated installation of 24-inch steel sheet piles driven by a vibratory hammer and then seated using an impact hammer in 39 to 45 feet of water at Berth 23 of the Port of Oakland, CA were reviewed to estimate potential sound levels (Table 2) (Buehler et al. 2015). Since sound levels produced by sheet pile driving at the wharf site are expected to be similar to those summarized in Table 2, they are not expected to exceed accepted thresholds for physical injury to fish (peak and SEL dB).

Table 2. Summary of sound level measures from unattenuated driving of 24" wide steel sheet piles (Buehler et al. 2015)

Site	Hammer Type	Distance measured (m)	*Behavioral Impacts*	*Physical Injury*	
			RMS (dB)	**Peak (dB)**	**Cumulative SEL (dB)**
		Thresholds:	**150**	**206**	**183 (Fish <2g)** **187 (Fish >2g)**
Berth 23, Port of Oakland	Vibratory	33	163	177	162
Berth 23, Port of Oakland	Impact	33	189	205	179

Cofferdam installation will take place outside the November-March window. The proposed cofferdams will be located adjacent to the existing wharf structures, which is not an area expected to have high concentrations of listed species foraging. Anticipated underwater sound produced by unattenuated vibratory pile driving activities will likely exceed the threshold for behavior modification (> 150 dB RMS) but remain below that of physiological injury (206 dB Peak). Based estimates in the GARFO Acoustics Tool (11/16/2016), the ensonified area expected to exceed the behavioral disturbance threshold is approximately 90 meters (300 feet) from the source. Since the sheet piles will be located near the southern shore of the river, a safe zone of passage of approximately 1,000 feet will be available for any listed species that may be foraging or migrating in the river. Therefore, sheet pile installation is not expected to cause physiological harm or substantial behavior modification to Atlantic and shortnose sturgeon. Because there is a sufficient zone of passage to avoid the ensonified area, any effects on sturgeon from sturgeon making minor movements to avoid sheet pile cofferdam installation will be too small to be meaningfully measured or detected, and are insignificant.

6.1.2 Water Quality

6.1.2.1 Turbidity

Increased turbidity can have two major effects on fish: 1) direct physiological effects, ranging from sublethal effects to mortality; and 2) behavioral effects, ranging from a startle response to avoidance. All proposed in-water work in the action area may increase turbidity.

The proposed dredging for the wharf extension is likely to be the most significant source of turbidity. Other in-water work activities could also result in elevated turbidity levels. All dredging will take place between November 15 and March 15, a period of time when sturgeon are unlikely to occur within the action area. Re-suspended sediment is expected to settle out of the water column within a few hours. Suspended sediment levels from conventional mechanical clamshell bucket dredging operations have been shown to range from 105 mg/L in the middle of the water column to 445 mg/L near the bottom (210 mg/L, depth-averaged) (USACE 2001). Furthermore, a study by Burton (1993) measured turbidity levels 500, 1,000, 2,000 and 3,300 feet from dredge sites in the Delaware River and were able to detect turbidity levels between 15 mg/L and 191 mg/L up to 2,000 feet from the dredge site. Based on these analyses, elevated suspended sediment levels of up to 445 mg/L may be present in the immediate vicinity of the clamshell bucket, and suspended sediment levels of up to 191 mg/L could be present within a 2,000-foot radius from the location of the clamshell dredge. The TSS levels expected for mechanical dredging are below those shown to have adverse effect on fish (580 mg/L for the most sensitive species, with 1,000 mg/L more typical; see summary of scientific literature in Burton 1993).

The life stages of sturgeon most vulnerable to increased sediment are eggs and larvae which are subject to burial and suffocation. However, no eggs and/or larvae are expected to be present in the action area.

TSS is most likely to affect sturgeon if a plume causes a barrier to normal behaviors. Sub adult and adult sturgeon are frequently found in turbid water but would be capable of avoiding any sediment plume by swimming higher in the water column. Laboratory studies (Niklitschek 2001; Secor and Niklitschek 2010) have demonstrated shortnose sturgeon are able to actively avoid areas with unfavorable water quality conditions and that they will seek out more favorable conditions when available. While the increase in suspended sediments may cause listed species to alter their normal movements, any change in behavior is likely to be insignificant as it will only involve movement further up in the water column or around the turbid area.

The substrate within the action area largely consists of gravel, coarse sand, cobbles, and ledge due to water velocity that can approach 3.5 knots per hour (6 feet per second) or more, which flushes the area of lighter, unconsolidated material. The heavier particles that are not moved downstream by the current are not likely to be re-suspended by the proposed socket drilling or seawall construction. Therefore, the increased turbidity in the river is expected to be minimal. The effects to listed species from construction activities, such as behavior modification due to an increase in TSS will likely be spatially limited to a few hundred meters up and down stream. Since the river is approximately 1,300 feet wide at the location of the action area, and construction activities will be located entirely along the southern shoreline, there will be a sufficient zone of passage where listed species can forage or migrate up/downstream without being exposed to any TSS resulting from construction activities. Further, construction activities will be sequential, which will further minimize increases in turbidity. For these reasons, physical and behavioral turbidity effects on sturgeon will be too small to be meaningfully measured or detected, and are insignificant.

Northern right whale and fin whale do not occur in the location where turbidity will be generated from construction activities. However, disposal of the dredged material at the Cape Arundel Disposal Site will also generate turbidity. During the discharge of sediment at offshore disposal sites, suspended sediment concentrations have been reported as high as 500.0 mg/L within 250 feet (76 meters) of the disposal vessel and decreasing to background levels (i.e. 15.0-100.0 mg/L depending on location and sea conditions within 1,000-6,500 feet (305-1981 meters) (ACOE 1983). Multiple characterizations of disposal plume spatial and temporal dynamics have been conducted by the USACE New England District, providing an extensive body of knowledge on all aspects of off-shore disposal (e.g., Fredette and French 2004, SAIC 2005). TSS concentrations near the center of the plume created by the placement of dredged material have been observed to reach near background levels in 35-45 minutes (Battelle 1994 in ACOE and EPA 2010). No information is available on the effects of total suspended solids (TSS) on whales. TSS is most likely to affect whales if a plume causes a barrier to normal behaviors. Whales in the action area during disposal of dredged materials may avoid interacting with a sediment plume by swimming around it. However, if whales do interact with the plume, the TSS levels are below those shown to have an adverse effect on fish (Burton 1993), so it is reasonable to assume that these levels would also be below those that would cause adverse effects to whales. Based on this information, physical and behavioral turbidity effects on sturgeon will be too small to be meaningfully measured or detected, and are insignificant.

6.1.2.2 Contaminants

A grain size analysis was completed for the material that will be dredged. The material is granular and not expected to hold contaminants.

Intentional discharges of pollutants or materials will not be allowed. However, the use of heavy equipment in or near a waterbody increases the risk of contaminants (fuel, oil, hydraulic fluid, etc.) accidentally releasing into the project site and possibly degrading habitat conditions and threatening aquatic organisms. The Contractor will be required to develop and implement a Stormwater Pollution Prevention Plan (SWPPP), which will include provisions to avoid impacts from hazardous chemicals associated with construction activities, such as diesel fuel, oil, lubricants, and other hazardous materials. Careful adherence to an approved SWPPP will make it extremely unlikely that listed species will be exposed to harmful chemicals from a spill or accident.

Concrete will be poured during low tide. Concrete for the main wharf fender system haunches and the facing on both the existing steel sheet pile bulkhead and bridge abutment will be contained in forms. The project is not expected to increase pH levels in the river and effects to listed species are discountable.

6.1.3 Capture/Entrapment During Dredging

Aquatic species can be captured in dredge buckets and may be injured or killed from entrapment in the bucket or burial in sediment during dredging and/or when sediment is deposited into the dredge scow. Fish captured and emptied out of the bucket could suffer severe stress or injury, which could also lead to mortality. The proposed dredging will take place between November 15 and March 15, a period of time when sturgeon are unlikely to be present in the action area.

According to information provided by NOAA in the SML bridge consultation (FHWA 2013), two interactions (one lethal) with shortnose sturgeon (2003 and 2009) and one with Atlantic sturgeon (2001) have been observed (NMFS 2012a) since 1997. An Atlantic sturgeon was also killed in the Cape Fear River, North Carolina in a bucket and barge operation (NMFS 1998). Nearly all of the recorded interactions between mechanical dredges and sturgeon have been during dredging at the Bath Iron Works (BIW) facility, although it is unknown if this is due to a unique situation in this river or the intense observer coverage at dredging operations in this river. Very few other mechanical dredge operations have employed observers to document interactions between sturgeon and the dredge; therefore, it is possible that interactions during other projects have occurred but just not been observed. Based on the best available information and the small size of the area to be dredged, the probability of a sturgeon being captured in a slow-moving dredge bucket in the lower Piscataqua River is low. This is evidenced by the small number of sturgeon captured during dredging operations at BIW since 1997, despite the high density of shortnose sturgeon in the Kennebec River and the occurrence of over 10 dredge events, with dredging happening nearly every year. Therefore, it can be concluded that the capture or entrapment of sturgeon by a clam shell bucket during proposed dredging at the wharf is extremely unlikely and therefore discountable.

6.1.4 Vessels

Sturgeon and whales may be injured or killed as a result of being struck by boat hulls or propellers. The factors relevant to determining the risk to these species from vessel strikes vary but may be related to the size and speed of the vessels, navigational clearance (i.e., depth of water and draft of the vessel) in the area where the vessel is operating, and the behavior of individuals in the area (e.g., foraging, migrating, overwintering, etc.). No evidence of ship strike interactions with sturgeon on the Piscataqua River is available. Vessel strikes are a major threat to North Atlantic right whales and fin whales along the Eastern seaboard.

The Piscataqua River is a Federal navigational channel and supports a wide variety of commercial and recreational activities, with over 600 vessels with drafts between 0 and 39 feet recorded on the river in 2016. Commercial vessels averaged approximately 78 vessel visits per year based on 2011 data. Commercial vessels range in length from 420 feet to 747 feet, with most vessels in the 20,000 to 50,000 DWT range. The intent of the proposed project is to replace the lost operational capacity of the barge wharf. The project will not alter the number of or type of vessels that currently utilize the Port of NH.

The proposed dredging and disposal sites are located in areas with existing, regular commercial shipping traffic. It is not anticipated that vessel traffic resulting from the proposed dredging will result in a meaningful increase in the number of vessels above background levels, nor is it anticipated that the Contractor's dredge scow will be meaningfully different in speed, draft, or noise as compared with existing shipping traffic.

The use of construction vessels during the construction period will not meaningfully increase the risk of interactions between listed species and vessels in the action area when added to baseline conditions. The use of the dredge scow for dredged material will be in the winter, which will further reduce the likelihood of interactions. As such, any increased risk of a vessel strike caused by the project will be too small to be meaningfully measured or detected. As a result, the increased risk of a vessel strike on listed species in the action area is insignificant.

6.1.5 Habitat Alteration

The action area contains marginal foraging habitat for Atlantic and shortnose sturgeon and contains no suitable habitat for rearing or spawning. Substrate in the proposed dredge area consists mostly of gravel (over 50%) and sand (37-47%), with less than one percent of silt and clay particles and no cobbles. The substrate in the area of the proposed wharf extensions consists primarily of cobbles. No shellfish beds or submerged aquatic vegetation occurs in the action area. The Cape Arundel Disposal Site consists of a silt/clay bottom admixed with fine sand. However, the proposed project does have the potential to effect potentially suitable sturgeon habitat or result in a loss of benthic resources. There will be a loss of 56,720 square feet of habitat due to direct impacts from proposed piles, dredging, and sea wall abutments. TSS levels could reach levels that are toxic to benthic communities in the immediate vicinity of the clamshell bucket during dredging; however, the small area of the dredge (1.3 acres) compared to the overall size of the action area (103 acres) will not result in meaningful reductions in the quality or quantity of sturgeon prey currently available.

Estuarine habitats can also be impacted indirectly by shading by overwater structures. Shading has been found to adversely affect tidal marshes, submerged aquatic vegetation, and benthic invertebrate communities (Struck et al. 2004). The proposed wharf extensions and relocated dock will result in the shading of 25,000 square feet of potential foraging habitat. Since no shellfish beds or submerged aquatic vegetation occur in these areas, impacts to habitat from shading are expected to be insignificant.

Due to the marginal quality of foraging habitat currently present in the action area, and the availability of more suitable forage areas in other parts of the river, sturgeon are unlikely to be foraging in the affected area. Impacts to habitat are minimal when compared with the amount of available habitat within the action area, with only approximately 1.8% of the 103 acres of habitat in the action area impacted. Habitat impacts from the proposed project will be located entirely along the southern shoreline, adjacent to habitat that has been previously impacted by bridge and wharf construction. For these reasons, impacts to habitat are expected to be insignificant and are not likely to adversely affect listed species.

6.1.6 Effects on Atlantic Sturgeon Critical Habitat

Atlantic sturgeon critical habitat consists of four physical or biological features (PBFs). The following provides an analysis of the proposed project on each of the PBFs of Atlantic sturgeon critical habitat that are present in the action area.

PBF 2: Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development.

Salinities within the action area fall within the salinity range associated with PBF 2. Substrate in the dredge area consists of over 99% coarse grain material, primarily gravel (over 50%) and sand (37-47%), with less than one percent of silt and clay particles and no cobbles. Substrate within the overall action area is likely similar, with a mix of hard and soft substrates, and the action area is located upstream from the mouth of the Piscataqua River. Therefore, PBF 2 is present in the action area. Dredging and wharf construction will result in the permanent removal of bottom habitat from within a 56,720 square foot (1.3-acre) footprint, of which approximately 48% (27,225 square feet or 0.63 acre) consists of soft substrates. Due to the tidal nature of the waterbody, the project does not have the potential to impact salinity gradients.

If it is assumed that approximately half of the 103-acre action area, or 51.5 acres, consists of soft substrates, similar to the project footprint, then the project would result in the removal of approximately 1% of suitable juvenile foraging habitat (PBF 2) within the action area. Based on the fact that this area is not known to support aggregating sturgeon, and any sturgeon that migrate through will be opportunistically foraging, the effects of the loss of soft sediment habitat within the action area, where this type of habitat is ubiquitous, on juvenile foraging or physiological development, will be so small that they cannot be meaningfully measured, evaluated, or detected. Any effects of removing this extremely small portion of the action area's foraging habitat on the ability of PBF 2 to provide conservation function to the future use of the action area by juvenile Atlantic sturgeon are too small to be meaningfully measured or detected, and are, therefore, insignificant.

PBF 3: Water of appropriate depth and absent physical barriers to passage between the river mouth and spawning sites necessary to support: Unimpeded movements of adults to and from spawning sites; seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; staging, resting, or holding of subadults or Spawning condition adults. Water depths in main river channels must also be deep enough (e.g., at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river.

The action area is characterized by suitable water depths and a lack of physical barriers to passage between the mouth of the river and potential upstream spawning sites. While spawning has not been documented in the Piscataqua River system, PBF 3 is present in the action area. The project will not result in permanent barriers to passage. The project will include activities that temporarily cause increases in hydroacoustic noise and turbidity. However, the river is approximately 1,300 feet wide at the project site, and a sufficient zone of passage will be present for sturgeon to avoid the ensonified area and elevated turbidity. Given that there is a sufficient area of passage, the dredging and pile driving will not obstruct or impede sturgeon movement during project construction or operation of the wharf, and, therefore, any effects to PBF 3's conservation function (i.e., supporting unimpeded movement of sturgeon to perform necessary life functions) in the action area will be too small to be meaningfully measured or detected, and are therefore, insignificant.

PBF 4: Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: Spawning; annual and interannual adult, subadult, larval, and juvenile survival; and larval, juvenile, and subadult growth, development, and recruitment (e.g., 13 °C to 26 °C for spawning habitat and no more than 30 °C for juvenile rearing habitat, and 6 mg/L or greater DO for juvenile rearing habitat).

The waters in the action area support spawning, survival of all life stages, and the growth, development, and recruitment of larvae and subadults. While spawning has not been documented in the Piscataqua River system, PBF 4 is present within the action area. The proposed project is not expected to alter the temperature, salinity, or dissolved oxygen levels associated with PBF4 within the action area. Project activities may result in temporary increase in turbidity that may temporarily reduce dissolved oxygen. However, the reduction is expected to settle out rapidly in the high velocities of the Piscataqua River before effects would impact the value of the feature for any life stage of Atlantic sturgeon. Therefore, impacts to PBF 4's conservation function (i.e., the water quality values necessary for annual and interannual adult, subadult, and juvenile survival, as well as juvenile, and subadult growth, development, and recruitment) will be short term and/or too small to be meaningfully measured or detected, and insignificant.

Summary

While the action area is located within the critical habitat designated for Atlantic sturgeon, all effects to the PBFs present in the action area are considered to be insignificant, as demonstrated above. Therefore, the proposed project is not likely to adversely affect any of the PBFs associated with, and will not adversely modify or destroy, the critical habitat for Atlantic sturgeon.

6.1.7 Effects on North Atlantic Right Whale Critical Habitat

A portion of the proposed transport route to the Cape Arundel Disposal Site overlaps with North Atlantic right whale critical habitat. North Atlantic right whale critical habitat consists of four physical or biological features (PBFs). The following provides an analysis of the proposed project on each of the PBFs that are present in the action area (PBF 1 and 3).

PBF 1: The physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate Calanus finmarchicus for right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes.

PBF 3: Late stage C. finmarchicus in dense aggregations in the Gulf of Maine and Georges Bank region.

The action area overlaps with designated critical habitat in the Gulf of Maine, although it is not located within the vicinity of Georges Bank or Jordan, Wilkinson, and Georges Basins. Only two of the four PBFs to right whale foraging, as described above, are considered likely to be present.

The only project activity that will be located in right whale critical habitat is the transport of dredged material via a dredge scow. It is not anticipated that vessel traffic resulting from the proposed dredging will result in a meaningful increase in the number of vessels above background levels, nor is it anticipated that the dredge scow will be meaningfully different in speed, draft, or noise as compared with existing shipping traffic. The project will have no effect on the physical oceanographic conditions and structures of the Gulf of Maine. Based on the best available information, we conclude that the proposed action will not have any effect on PBFs 1 and 3 or any other physical and biological features for right whale critical habitat.

6.2 Interrelated and Interdependent Actions and Activities

Interrelated and interdependent actions are those that are part of a larger action and depend on the larger action for their justification. The proposed project is a direct result of the recent replacement of the SML Bridge. Until recently, the SML Bridge divided the port between the main wharf and the barge wharf. The bridge was recently replaced on a new alignment to improve the safety of navigating vessels, and the new bridge now passes through the western end of the barge wharf, requiring partial demolition of the wharf, blocking access to the boat ramp, and substantially reducing the berthing length along the barge wharf. For this reason, and due to the close proximity of the new bridge structure, the barge wharf can no longer be used to moor barges. The FHWA is funding the functional replacement of the barge wharf to compensate for impacts caused by the new alignment of the SML Bridge.

All potential adverse effects associated with the SML Bridge replacement have been previously evaluated and found to be insignificant or discountable.

7.0 Effect Determinations

7.1 Effect Determination for Listed Species

Based on this analysis, it has been determined that all effects, when added to baseline conditions, are insignificant or discountable, and not likely to adversely affect shortnose sturgeon, Atlantic sturgeon, North Atlantic right whale, or fin whale.

7.2 Effect Determination for Critical Habitat

Based on this analysis, it has been determined that all effects, when added to baseline conditions, are insignificant or discountable, and not likely to adversely affect critical habitat for Atlantic sturgeon or North Atlantic right whale.

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